

CASTING CONNECTION

• Your Link to Investment Casting News from Ransom & Randolph •

JUL 2018

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Viscosity 101

Viscosity is a quick and simple measurement that describes a fluid's resistance to flow. For example, a slurry with a high viscosity is thick, while a slurry with a low viscosity is thinner. Ensuring that slurries are within their proper viscosity ranges prior to dipping is critical, as viscosity can affect draining, shell thickness, coating quality and more. Measuring viscosity is the one test that can quickly give you an indication of slurry behavior and readiness and is crucial to the day-to-day operations of any foundry. It is recommended to check viscosity at least twice per shift and to record all results for record keeping.

Selecting the appropriate viscosity cup for your foundry is as equally important as testing viscosity itself. There are several types of viscosity cups on the market, including EZ, Zahn Signature/S90, Gardner/Fisher, Ford Dip, ISO and Standard Ford. Within each type, there are several styles (distinguished by number) to choose from. The number of the cup is determined by the hole size, through which material drains, in the bottom of the cup (i.e., the higher the number, the larger the hole). Cups with a higher number are used for more viscous liquids. As each type and number of cup gives its own unique reading, it is important to never switch



What to Know About this Important Test

cup types once one is selected. Viscosity conversion charts are available online if a viscosity conversion from one cup type to another is needed. It is important to refer to the vendor's application instructions when selecting a cup.

To begin the measurement, ensure that the cup is completely

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Deflating Air Bubbles



Air bubbles present as round or spherical metal defects or foam-like surface roughness.

This defect indicates that the metal managed to penetrate the primary coat; that air is trapped against the wax pattern and the shell formed around it; or there was a void from an air bubble at the surface of the wax.

The causes of this defect are evident in the shelling

portion of the process. To cure these causes, R&R recommends taking the following actions.

Cause 1: Inadequate defoam characteristics.

Cure 1: Conduct an antifoam test on the primary slurry and adjust,

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exclusively server-to-screen. You will be able to enjoy the same great articles on your desktop, laptop, tablet or smartphone.

Don't miss out on future issues! To stay in the loop, please make sure you are on our email list and subscribe today at: www.ransom-randolph.com/newsletters

Ditch that Dust in Your Jewelry Investment!



In identical testing conditions, conventional investment materials (left) release noticeably more fine dust than BANDUST technology treated jewelry investments (right).

Respirable crystalline silica presents a health hazard in the investing room and

silicosis has been a concern for jewelry casters for years. Historically, reducing the out-of-package exposure hazard for the operator has eluded manufacturers.

R&R's BANDUST™ technology significantly reduces respirable quartz and cristobalite exposure through a unique manufacturing process that allows us to bind typically respirable particles to the dry investment

powder during manufacturing.

Patented BANDUST technology significantly impacts the casting environment, providing immeasurable impact to the overall health and safety of casters. Based on third-party industrial hygienist air sampling test results, BANDUST technology **significantly reduces total respirable dust – up to 97% versus standard R&R jewelry investments and as much as 99% when compared to other jewelry investments.**

Additional testing for respirable dust was conducted during the quench phase of the casting cycle. The

industrial hygienist reported ***no measurable respirable dust from BANDUST technology flasks.***

Casters using BANDUST technology products indicate noticeably ***less dust overall during the investing process.***

Casters also noted the added benefit of improved housekeeping overall. Casting quality is maintained with ***excellent final casting results and no process changes*** are required during the investing stage.

Learn more at: www.ransom-randolph.com/bandust-technology

Deflating Air Bubbles

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if necessary.

Cause 2: The primary slurry was not stabilized for a sufficient period of time and air bubbles were not allowed to escape from the mix before dipping.

Cure 2: Check that the slurry is being allowed to stabilize before using in process.

Cause 3: There is air in the slurry and the slurry was allowed to stabilize before use.

Cure 3: Check the mixing equipment to verify that it is not creating too much action and pulling air into the slurry. Conduct an antifoam test on the slurry to determine if antifoam should be added.

Cause 4: Poor dipping technique.

Cure 4: Reduce dipping speed and/or adjust dipping angles to eliminate the introduction of air bubbles into the slurry layer.

Cause 5: Dipping technique traps air in detail.

Cure 5: Change dipping technique to avoid trapping air, use air wand to blow slurry into detail, brush or prewet.

Cause 6: Aggressive mixing – pulling in air.

Cure 6: Control mixing speed, use a timer.

Cause 7: Dried slurry formations on the sides of tanks and on propeller shafts introduces air into the slurry.

Cure 7: Clean tank sides and shaft.

Ask Our Jewelry Expert

Q: When mixing investment, is distilled or deionized water required, rather than tap water? What is the difference?

A: Distilled or deionized water is recommended because it is more consistent than tap water and it gives repeatable results.

Impurities in tap water can change the working and set time of an investment. With distilled or deionized water, the impurities are minimized so the investment properties are more repeatable drum to drum and batch to batch. All of R&R's retained batch samples are evaluated using deionized water to ensure batch to batch consistency.



Have a question?

Ask our jewelry expert!

Mike.Stover@dentsply.com

For more jewelry FAQs, visit: www.ransom-randolph.com/jewelry-faqs

Subscribe to Our YouTube Channel!

We are excited to announce the launch of our YouTube channel!

Be sure to check it out for ceramic shell and jewelry casting tips and tricks, how to guides, and more!

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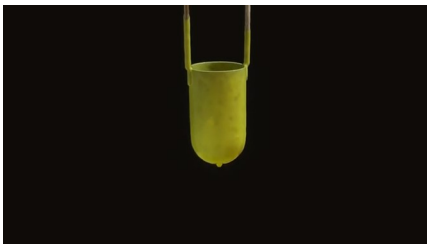


Viscosity 101

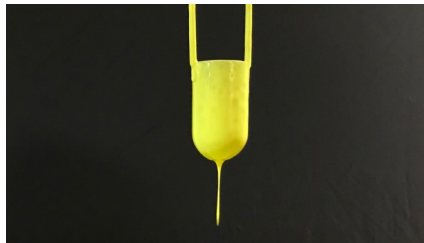
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clean and dry. With a stopwatch in hand, submerge the cup into the slurry so that the entire cup is covered in slurry. Pour the slurry out. At this point, the cup should be completely coated with slurry. Re-submerge the cup into the slurry and pull it straight up and out of the slurry. Start the stopwatch immediately once the cup clears the surface of the slurry. Stop the stopwatch at either of the following three endpoints.

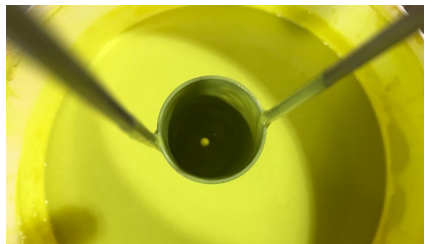
Break at the bottom: watching from the side of the cup, when the slurry breaks at the bottom of the cup.



One inch below: watching from the side of the cup, when the slurry breaks one inch below the bottom of the cup.



Through the hole: looking down into the cup, when daylight can be seen through the hole.



When viscosity measurements are taken, the stopwatch should always be stopped at the same endpoint. It is vital to ensure that all operators are measuring viscosity using the same method and stopping the measurement at the same endpoint. Consistency is key in measuring viscosity. Variabilities between operators can cause issues such as running an out of specification slurry or

unnecessarily adjusting a slurry that is actually within specifications. These issues can result in poor shell quality, wasted slurry, and more.

When measuring viscosity, it is also important to consider the location of the measurement inside the slurry tank. Taking the viscosity measurement where the slurry is mixing well and there is no pooling of slurry is the desired location in the tank. It is good practice to also survey the viscosity profile across the surface of the slurry tank to ensure that the viscosity does not fluctuate more than 1-2 seconds across the tank. Parts are typically dipped into the center area of the tank. If the viscosity is too low in that location, thinner/weaker shells can result. If this becomes an issue, mixing speed, propeller location or paddle design can be adjusted for more consistent mixing.

As viscosity cups are used over

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Ask Our Ceramic Shell Expert

Q: What does the term green strength mean and how can it be controlled?

A: Green strength is a measure of how strong the shell is at dewax.

The stronger the shell, the more likely it will survive dewax without cracking.

Green strength can be manipulated using different refractories or additives.

Contact our ceramic shell expert for more information.



Have a question?

Ask our ceramic shell expert!

Dave.Berta@dentsply.com

For more ceramic shell FAQs, visit: www.ransom-randolph.com/ceramic-shell-faqs

R&R is GDPR Compliant

At R&R, we are committed to protecting your data.

The General Data Protection Regulation (GDPR) was recently approved and adopted by the European Union (EU). The GDPR is a regulation intended to

strengthen and unify data protection for all individuals within the EU. It aims to protect the fundamental right to privacy and the protection of personal data.

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Viscosity 101

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time, they should be checked to ensure that they are still providing accurate readings. Any slight damage to the cup (from dropping or denting it) can cause the cup to provide inaccurate measurements. Facilities should have two sets of cups: one set to be used on a daily

basis, referred to as floor cups, and another set of cups, referred to as control cups, to be kept in a controlled, clean, environment, such as a supervisor's office. Periodically, measure viscosity using both cups and record the results. When there is variation of more than 2 seconds between the floor cups and control cups, the floor cups should be discarded and replaced with the control cups and new

control cups should be purchased.

When taking viscosity measurements, the following factors should be considered and documented.

- Define the type and number of viscosity cup used for each slurry.
- Indicate the location inside the tank where viscosity measurements are taken.
- Clearly define the endpoint for viscosity measurement.
- All operators should know how many viscosity readings they need to conduct (i.e., an average of two successive readings) and define an allowable variation from reading to reading.
- Test viscosity at least twice per shift.

- Refer to vendor's application instructions for viscosity targets and allowable ranges.
- Properly care for and store viscosity cups.
- Clean cups with water.
- Thoroughly dry and hang clean cups or store cups in clean water.

Conducting regular viscosity testing in your foundry is essential to best control the properties of your slurry. It is necessary to ensure that the methods and tools you are using to test slurry viscosity are consistent and in proper working condition, so that they can continue to provide dependable results. Consistent test results lead to a more stable slurry, which in turn leads to better castings, with thicker, stronger shells.



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Investing with Innovation™



Founded in 1872, Ransom & Randolph is dedicated to advancing the investment casting industry. R&R has provided foundries with extensive process knowledge, exceptional technical expertise and innovative product technology since the 1800s. By coupling revolutionary product developments with experienced staff, manufacturing and warehousing facilities, R&R successfully helps customers become casting industry leaders. R&R is a wholly owned subsidiary of DENTSPLY International (NASDAQ: XRAY).

R&R's core businesses are composed of Ceramic Shell, Industrial Mold, Jewelry and Dental Investment Casting.

R&R takes great pride in providing customers with a pleasant procurement experience. R&R's Maumee, Ohio based customer service team services North America and US export customers. Our UK-based agent, HTM Tradeco, Ltd., provides service for the European Union. From initial order placement through delivery, R&R's customer service team takes responsibility for accurate and efficient processing of your material needs. As a result, R&R's customer service team is unmatched in the industry.



R&R Report Card



Earlier this year, in an effort to help us provide products and services that continue to meet your

needs, we asked you to complete a customer satisfaction survey. Thank you for taking the time to share your thoughts! Here is what you had to say about us.

Overall, R&R products were described as *reliable, high quality and useful.*

On average, R&R received the following ratings to the following questions:

How well do R&R products meet your needs? *Very Well*

How would you rate R&R for customer service/order placement?

Above Average

How responsive has R&R been to your technical questions or concerns with regards to our products? *Very Responsive*

How responsive has R&R been to your technical questions or concerns with regards to process issues in your foundry? *Very Responsive*

How would you rate the usefulness of the answers you have received to your technical questions? *Above Average*

How likely is it that you would recommend R&R to another caster? *Very Likely*

How likely are you to purchase from R&R again? *Very Likely*

Overall, how satisfied are you with R&R? *Very Satisfied*



Kiln Korner

This year, PKI will be celebrating 40 strong years in the investment casting industry! As a technology leader for the last 40 years, PKI has set themselves apart from the pack by being the only manufacturer that is solely dedicated to the investment casting foundry and their needs.

Please join us in wishing PKI a very happy 40th!

